APPENDIX A

ON-CALL STORAGE USE

Article IV, Paragraph 2(b) of the Treaty states that any additional storage in the Columbia River basin in Canada will be operated within the limits of existing facilities as required to meet flood control needs for the duration of the flood period when called upon by the United States Entity. This "On-Call" storage, as defined under the terms of the Treaty, applies principally, but not exclusively, to the full use of Mica, Arrow and Duncan projects for control of major floods. The Primary Storage at the Canadian storage projects amounts to 8,450,000 acre-feet out of a total of 20,500,000 acre-feet of usable storage capacity. Thus, there is an additional 12,050,000 acre-feet of storage capacity in Mica, Arrow, and Duncan available for control of major floods, most of which is located at Mica.

A large part of this On-Call storage would normally be evacuated during the winter, but this is not assured. Under Paragraph I(3) of the Protocol, a delay of twenty days may be encountered before the request for On-Call storage use is honored. With consideration to the discharge limitations at each project, the time required to prepare forecasts, and the time to process a request, it will be necessary for consultations on the use of On-Call storage to commence in early January, in order to be assured that the storage space at each project can be made available by 1 April. Once the decision for use of On-Call storage has been made, Canadian storage will be operated to provide the amount of storage space required by each project's Storage Reservation Diagram within the limitation of the outlet facilities. Payment for the use of On-Call storage will be in accordance with Article VI, Paragraph 3 of the Treaty.

As defined in Paragraph I(1) of the Protocol, On-Call storage may be requested only for potential floods which could result in a peak discharge in excess of 600,000 cfs at The Dalles, assuming storage regulation of United States projects existing or under construction in January 1961, together with the Primary Storage provided in Canadian Treaty projects, plus storage in Libby project. This amount of storage will assure a reduction of about 300,000 cfs in the peak discharge of major floods at The Dalles. Accordingly, a natural flood peak of 900,000 cfs could be regulated to about 600,000 cfs.

As a basis for determining when a flood, so regulated, could exceed 600,000 cfs, the peak-to-volume relationship for Columbia River at The Dalles was plotted as shown on Chart 1A. The independent variable for this relationship is the April through August volume of runoff at The Dalles for the years 1879 through 1997. The dependent variable is the corresponding peak discharge. The data represents unregulated conditions; that is, observed peaks and volumes were adjusted to compensate for the storage regulation of upstream reservoirs. Eighty percent of the variability of the data is accounted for by the regression model (R squared equals 0.80). On the chart parallel to the line of best fit are lines representing plus or minus one standard error of the predicted peak discharge. Assuming the errors are normally distributed about the line of best fit, there is about a 65 percent probability that the predicted peak discharge will be within one standard error, plus or minus, of the best fit line. Further, there is about a 95 percent chance that the predicted peak discharge will be within two standard errors, plus or minus, of the best fit line.

Chart 1-A shows that unregulated peaks in excess of 900,000 cfs have occurred only when the April-August runoff exceeds 120 million acre-feet. There are, however, inherent errors in forecasting runoff volume, and the amount of these errors will vary

with the date on which the forecasts are made. A reasonable measure of the expected error in any given forecast is considered to be one standard error. The following table lists the standard errors in forecasts for the April through August runoff volumes for the Columbia River at The Dalles, based on forecasts made from hydrometeorological conditions as known on specified dates:

Date of Forecast	Standard Error, in acre-feet
1 January	15,000,000
1 February	12,000,000
1 March	10,000,000
1 April	9,000,000

If the forecast of April through August runoff volume at The Dalles, on the various dates, exceeds the following values, the potential exits of a flood exceeding 900,000 cfs unregulated and 600,000 cfs regulated:

Date of Forecast	Forecast of Runoff Volume in acre-feet
1 January	105,000,000
1 February	108,000,000
1 March	110,000,000
1 April	111,000,000

The forecast runoff amounts listed above constitute the basis on which consultation on a call may be initiated by the United States. Consultation on the need for a call should begin as soon as conditions indicate a call may be necessary and the actual call may be made by the United States Entity as soon as possible thereafter to assure the evacuation from Mica, Arrow, and Duncan of as much stored water as possible. The

call may be delayed to 1 February or 1 March, if partial evacuation has already been accomplished. If there should be a significant increase in the forecast runoff volume during the period 1 January to 1 April, consultation on the need for a call may be initiated at such time as the forecast exceeds the above values.

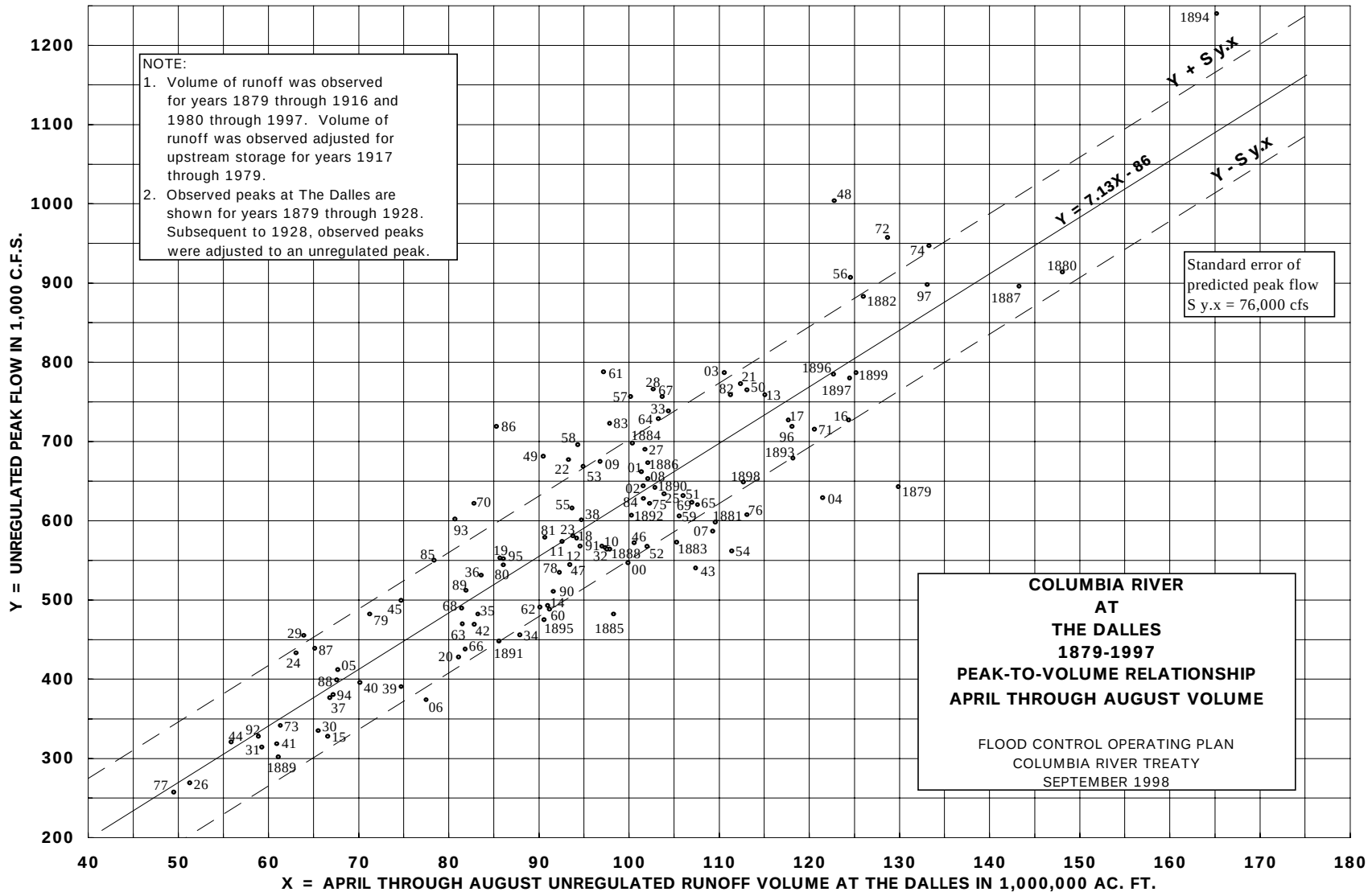
NOTE:
1. Volume of runoff was observed for years 1879 through 1916 and 1980 through 1997. Volume of runoff was observed adjusted for upstream storage for years 1917 through 1979.
2. Observed peaks at The Dalles are shown for years 1879 through 1928. Subsequent to 1928, observed peaks were adjusted to an unregulated peak.
Y + S y.x
Y = 7.13X - 86
Y - S y.x
Standard error of predicted peak flow
S y.x = 76,000 cfs
COLUMBIA RIVER
AT
THE DALLES
1879-1997
PEAK-TO-VOLUME RELATIONSHIP
APRIL THROUGH AUGUST VOLUME
FLOOD CONTROL OPERATING PLAN
COLUMBIA RIVER TREATY
SEPTEMBER 1998
Y = UNREGULATED PEAK FLOW IN 1,000 C.F.S.
X = APRIL THROUGH AUGUST UNREGULATED RUNOFF VOLUME AT THE DALLES IN 1,000,000 AC. FT.
200
300
400
500
600
700
800
900
1000
1100
1200
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180

CHART 1-A